PTO/SB/33 (04-05)
Approved for use through xx/xx/200x. OMB 06551-00xx
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Docket Number (Optional)
024.0037 (01-3187)

I hereby certify that this correspondence is being transmitted by facsimile on the date shown below to the United States Patent and Trademark Office at (571) 273-8300.

Signature_____.

Typed or printed Name_____.

In re Application of **Clifford C. Bampton**

Application Number	Filed
10/718,961	November 21, 2003

For: **LASER SINTERED TITANIUM ALLOY AND DIRECT METAL FABRICATION METHOD OF MAKING THE SAME**

Group Art Unit	Examiner
1742	**McNelis, Kathleen A.**

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).

Note: No more than five (5) pages may be provided.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest.
See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

☒ attorney or agent of record.
Registration number **42,314**

☐ attorney or agent acting under 37 CFR 1.34(a).
Registration number if acting under 37 CFR 1.34(a). _____.

/DAVID K. BENSON/
Signature

David K. Benson
Printed Name

(480) 385-5060
Telephone Number

April 25, 2007
Date

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	10/718,961	Confirm. No.:	4430
Applicant:	Clifford C. Bampton	Art Unit:	1742
Filed:	November 21, 2003	Examiner:	McNelis, Kathleen A.
Docket No.:	024.0037	Customer No.:	55,397

Title: LASER SINTERED TITANIUM ALLOY AND DIRECT METAL FABRICATION METHOD OF MAKING THE SAME

ARGUMENTS ACCOMPANYING PRE-APPEAL BRIEF REQUEST FOR REVIEW

I. Status of Claims

Claims 1 to 7, 9 to 15, 17 to 20, and 24 are pending on appeal, with claims 1, 9, and 20 being independent claims. All amendments to the claims have been entered. In general, one aspect of the claimed invention is a method for selective sintering a powder (independent claim 1). Another aspect of the invention is a method for fabricating a metal part (independent claim 9). Yet another aspect of the invention is a powder blend for forming metallic parts in a layer-by-layer technique with each layer of said metallic parts being formed in accordance with a CAD file (independent claim 20).

Claims 1 to 2, 9 to 10, 20, and 24 are rejected as being anticipated under 35 U.S.C. § 102(b). Furthermore, all of the pending claims are rejected under 35 U.S.C. § 103(a). Particularly, claims 1 to 2, 9 to 10, 20, and 24 are rejected under 35 U.S.C. § 102(b) or 103(a) as being either anticipated by, or unpatentable over, the Elsevier Science Ltd. publication entitled, "AeroMet implementing novel Ti process" (Aeromet). Claims 1 to 3, 9 to 11, 18 to 20, and 24 are rejected as being unpatentable over Aeromet in view of any one of U.S. Patent No. 4,725,509 (Ryan), Welding Research Publication entitled, "Transient Liquid-Phase Bonding Using Coated Metal Powders" (Zhuang), or Metallurgical and Materials Transactions Publication entitled, "Infrared Transient-Liquid-Phase Joining of SCS-6/B21S Titanium Matrix Composite" (Blue). Claims 4 to 5, 7, 12 to 13, and 15 are rejected as being unpatentable over Aeromet in view of Blue. Claims 6 and 14 are

rejected as being unpatentable over Aeromet in view of Blue or Zhuang. Claim 17 is rejected as being unpatentable over Aeromet in view of Ryan or Blue or Zhuang, further in view of U.S. Patent No. 5,182,170 (Marcus). Claim 18 is rejected as being unpatentable over Aeromet in view of Ryan or Blue or Zhuang, further in view of a Materials and Design Publication entitled, "Processing of titanium net shapes by SLS HIP" (Suman).

II. Arguments Directed to the Rejections under 35 U.S.C. § 102(b)

Claim 1 recites a method in which a powder blend is spread on a platform, the powder blend comprising a base metal of titanium or alloy thereof having a first melting temperature and an alloying metal having a second melting temperature lower than said first melting temperature. An energy beam is then selectively focused onto the powder blend. Nowhere in Aeromet is there any teaching or suggestion of either of these two fundamental method steps.

Aeromet discloses a process in which a base metal substrate is heated with a laser to create a molten pool, and then another powder is fed into the molten pool. The Examiner notes that according to one embodiment, the powder that is fed into the molten pool may be a mix of elemental powders of Ti, Al, and V (Aeromet, page 25). Thus, Aeromet clearly fails to teach or suggest a method in which a powder blend is ***spread into a layer*** on a substrate, and then a laser is ***directed onto selected areas of the layer*** of powder. The powder that is deposited according to the Aeromet process never has a chance to spread into a layer of powder since it is melted before it reaches a substrate. Furthermore, since no layer of powder ever exists, Aeromet clearly fails to teach or suggest directing a laser onto a previously-spread layer of powder.

In the Advisory Action dated April 2, 2007, the Examiner asserts that Aeromet "teaches depositing material in the form of a powder to form layers ... ." However, the Examiner is failing to note that while Aeromet discloses the formation of layers, the layers that are formed according to Aeromet do not comprise "a layer of powder blend" or "powder blend layers" as recited in claim 1. Rather, Aeromet discloses forming layers of molten material, which then solidify to form layers of solid, non-powdered material. A person of skill in the art would not be motivated to perform the present method, involving the two steps recited above, when Aeromet merely discloses a method in which powder is deposited into a molten pool and then allowed to solidify (see FIG. 1 of Aeromet

and associated caption). For at least this reason, Aeromet fails to teach or suggest the features of independent claim 1, and the rejections of claims 1 to 2 should be withdrawn.

Furthermore, claim 1 recites that the powder blend includes a base metal of titanium or alloy thereof, and an alloying metal, both of which are selected and quantitatively included in the powder blend based on a characteristic of the base metal to dissolve in but not react with the liquid alloying metal at a particular annealing temperature. Even though Aeromet discloses the use of a powder of 6 wt.% Al, 4 wt.% V, balance Ti, this falls far short of teaching or suggesting that either of the Al and V is quantitatively added to the Ti in a manner whereby the Ti will dissolve in, but not react with, molten Al or V at a particular annealing temperature. Attached to the Advisory Action of April 2, 2007 is a reference book by ASM metals (ASM), and a text entitled Physical Metallurgy Principles (PMP). PMP provides a phase diagram for Ti-Al, and the Examiner notes that at 6wt.% Al, a binary Ti-Al alloy can be annealed in regions of β Ti at a temperature above the Al melting point and below the Ti melting point. Yet, the presence of a Ti-Al alloy seems to suggest the opposite of what is presently claimed, namely, that the elements are selected and quantitatively included in the powder blend based on a characteristic of the base metal to dissolve in but not react with the liquid alloying metal at a particular annealing temperature. Furthermore, even if the phase diagram supports the Examiner's assertion, the phase diagram does not represent the inclusion of 4 wt.% V, which would undoubtedly alter the phase diagram. Thus, the Examiner has not provided evidence that this additional feature of claim 1 is anticipated or obvious in view of Aeromet. For this additional reason, it is clear that Aeromet fails to teach or suggest the features of claims 1 and 2, and the rejections of these claims should be withdrawn.

Finally, claim 1 further recites that the alloying metal is re-solidified, and thereby binds the base metal. In contrast, Aeromet discloses a method in which the metal powder melts in its entirety and reacts to form an alloy that meets compositional and material property specifications for commercially pure Ti-6Al-4V (Aeromet, page 25). In the Advisory Action, the Examiner asserts that an alloy-forming reaction constitutes binding. It is clear from the recognized meaning of the term "binds," and the explicit teachings of the present specification, that the term "binds" denotes securing or holding in place, and not a reaction. Thus, there is no binding of a base metal taking place in the Aeromet method. For this additional reason, the rejections of claims 1 and 2 should be withdrawn.

Claim 9 is also directed to a method in which ***a powder blend is spread*** on a platform, the powder blend comprising a base metal of titanium or alloy thereof having a first melting temperature and an alloying metal having a second melting temperature lower than said first melting temperature. An energy beam is then ***selectively focused onto the layer*** of powder blend. Then, the alloying metal is re-solidified to ***bind the base metal***. As previously discussed, nowhere in Aeromet is there any teaching or suggestion of any one of these three method steps.

Claim 20 recites a powder blend of a base metal and an alloying metal, each being selected based at least on two criteria, namely, their differing melting points and a characteristic of the base metal to dissolve in but not react with melted alloying metal at a particular annealing temperature. Furthermore, claim 20 recites that the alloying metal includes Ti-15Cu-15N, and that the Ti-15Cu-15N is only between 10 wt.% and 30 wt.% of the entire powder blend. The only powder blend disclosed by Aeromet is on page 25, col. 2. The powder blend consists of a powder of 6 wt.% Al, 4 wt.% V, balance Ti. The deficiencies of this alloy with respect to the claim language have been discussed with regard to claim 1. For this additional reason, it is clear that Aeromet fails to teach or suggest the features of claim 20. Aeromet fails to disclose or suggest that an alloying metal includes Ti-15Cu-15N, and that the Ti-15Cu-15N is only between 10 wt.% and 30 wt.% of the entire powder blend. For this additional reason, the rejection of claim 20 should also be withdrawn.

The Zhuang, Blue, Ryan, Marcus, and Das references do nothing to compensate for the previously-discussed deficiencies of Aeromet. Blue is directed to a welding method in which a filler material of the alloy Ti-15Cu-15Ni is applied to a solid substrate to join two pieces of the substrate. According to the Blue welding method, all of the filler material is melted in order to create a sound joint. Thus, Blue clearly fails to teach or suggest a method in which a powder blend is spread into a layer on a substrate, and then a laser is ***directed onto selected areas of the layer*** of powder. Furthermore, there is no teaching or suggestion of a method in which re-solidification of a portion (the alloying material) of the powder blend binds the remainder (base metal) of the powder blend since the entire powder blend is melted according to the Blue method. Thus, Blue combined with Aeromet fails to teach or suggest the methods recited in claims 1 and 9, and the rejections of these claims should be withdrawn. Furthermore, like Aeromet, Blue fails to teach or suggest that an alloying metal includes Ti-15Cu-15N, and that the Ti-15Cu-15N is only between 10 wt.% and 30 wt.% of the entire powder blend as recited in claim 20.

Ryan is also directed to a welding method in which a filler metal that may be a Ni-Cu-Ti alloy is applied to a substrate. However, like the Blue welding method, all of the filler material disclosed by Ryan is melted in order to create a sound joint. Thus, Ryan clearly fails to teach or suggest a method in which a powder blend is spread into a layer on a substrate, and then a laser is ***directed onto selected areas of the layer*** of powder. Furthermore, there is no teaching or suggestion of a method in which re-solidification of a portion (the alloying material) of the powder blend binds the remainder (base metal) of the powder blend since the entire powder blend is melted according to the Ryan method. Thus, Ryan combined with Aeromet fails to teach or suggest the methods recited in claims 1 and 9, and the rejections of these claims should be withdrawn.

Finally, Zhuang is directed to a transient phase liquid bonding process in which a powder coating of Ti-Cu-Ni is applied to a solid substrate as a melting point depressant. Again, Zhuang fails to teach or suggest a method in which a powder blend is spread into a layer on a substrate, and then a laser is ***directed only onto selected areas of the layer*** of powder. Furthermore, there is no teaching or suggestion of a method in which re-solidification of a portion (the alloying material) of the powder blend binds the remainder (base metal) of the powder blend since the entire powder blend is melted according to the Zhuang method. Thus, Zhuang combined with Aeromet fails to teach or suggest the methods recited in claims 1 and 9, and the rejections of these claims should be withdrawn. Furthermore, Zhuang fails to compensate for the deficiency of Aeromet regarding claim 20, particularly regarding the percentage of alloying metal in a powder blend, and the particular percentages of Cu and Ni recited in claim 20. For this additional reason, the rejection of claim 20 based on Aeromet and Zhuang should also be withdrawn.

Respectfully submitted,

INGRASSIA FISHER & LORENZ

Dated: April 25, 2007

By: /DAVID K. BENSON/
David K. Benson
Reg. No. 42,314
(480) 385-5060